Sub A1

CLAIMS:

1. Integrated circuitry comprising a capacitor comprising a first capacitor electrode, a second capacitor electrode and a high K capacitor dielectric region received therebetween; the high K capacitor dielectric region comprising a high K substantially amorphous material layer and a high K substantially crystalline material layer.

2. The integrated circuitry of claim 1 wherein the high K substantially amorphous material and the high K substantially crystalline material constitute the same chemical composition.

3. The integrated circuitry of claim 1 wherein the high K substantially amorphous material and the high K substantially crystalline material constitute different chemical compositions.

Sub A1 Cont.

4. The integrated circuitry of claim 1 wherein at least one of the first and second electrodes comprises elemental metal, metal alloy, conductive metal oxides, or mixtures thereof.

5. The integrated circuitry of claim 1 wherein at least one of the high K substantially amorphous material layer and the high K substantially crystalline material layer contacts at least one of the first capacitor electrode and the second capacitor electrode.

Sub B1 Cont

6. The integrated circuitry of claim 1 wherein the high K substantially amorphous material layer contacts at least one of the first capacitor electrode and the second capacitor electrode.

7. The integrated circuitry of claim 6 wherein the high K substantially amorphous material layer contacts only one of the first capacitor electrode and the second capacitor electrode.

8. The integrated circuitry of claim 1 wherein the high K substantially amorphous material layer contacts one of the first and second capacitor electrodes and the high K substantially crystalline material layer contacts the other of the first and second capacitor electrodes.

9. The integrated circuitry of claim 1 wherein the high K capacitor dielectric region is the only capacitor dielectric region received between the first and second capacitor electrodes, and consists essentially of the high K substantially amorphous material layer and the high K substantially crystalline material layer.

10. The integrated circuitry of claim 1 wherein the high K substantially amorphous material layer is at least 98% amorphous, and the high K substantially crystalline material layer is at least 98% crystalline.

11. The integrated circuitry of claim 1 comprising a semiconductor substrate, the capacitor being received at least partially over the semiconductor substrate, the high K substantially crystalline material layer being received between the semiconductor substrate and the high K substantially amorphous material layer.

12. The integrated circuitry of claim 11 wherein the semiconductor substrate comprises bulk monocrystalline silicon.

13. The integrated circuitry of claim 11 wherein at least one of the high K substantially amorphous material layer and the high K substantially crystalline material layer contacts at least one of the first capacitor electrode and the second capacitor electrode.

A' cont.

14. The integrated circuitry of claim 11 wherein the high K substantially amorphous material layer contacts at least one of the first capacitor electrode and the second capacitor electrode.

15. The integrated circuitry of claim 1 comprising a semiconductor substrate, the capacitor being received at least partially over the semiconductor substrate, the high K substantially amorphous material layer being received between the semiconductor substrate and the high K substantially crystalline material layer.

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16. The integrated circuitry of claim 15 wherein the semiconductor substrate comprising bulk monocrystalline silicon.

17. Integrated circuitry comprising a capacitor comprising a first capacitor electrode, a second capacitor electrode and a Ta_2O_5 comprising capacitor dielectric region received therebetween; the Ta_2O_5 comprising region comprising a substantially amorphous Ta_2O_5 comprising layer and a substantially crystalline Ta_2O_5 comprising layer.

18. The integrated circuitry of claim 17 wherein at least one of the substantially amorphous Ta_2O_5 comprising layer and the substantially crystalline Ta_2O_5 comprising layer contacts at least one of the first capacitor electrode and the second capacitor electrode.

19. The integrated circuitry of claim 17 wherein the substantially amorphous Ta_2O_5 comprising layer contacts at least one of the first capacitor electrode and the second capacitor electrode.

20. The integrated circuitry of claim 19 wherein the substantially amorphous Ta_2O_5 comprising layer contacts only one of the first capacitor electrode and the second capacitor electrode.

21. The integrated circuitry of claim 17 wherein the substantially amorphous Ta_2O_5 comprising layer contacts one of the first and second capacitor electrodes and the substantially crystalline Ta_2O_5 comprising layer contacts the other of the first and second capacitor electrodes.

22. The integrated circuitry of claim 17 wherein the Ta_2O_5 comprising region is the only capacitor dielectric region received between the first and second capacitor electrodes, and consists essentially of the substantially amorphous Ta_2O_5 comprising layer and the substantially crystalline Ta_2O_5 comprising layer.

23. A capacitor forming method comprising:

forming a first capacitor electrode layer over a substrate;

forming a high K capacitor dielectric region over the first capacitor electrode layer, the high K capacitor dielectric region comprising a high K substantially crystalline material layer and a high K substantially amorphous material layer; and

forming a second capacitor electrode layer over the high K capacitor dielectric region.

24. The method of claim 23 comprising forming the high K substantially amorphous material and the high K substantially crystalline material to constitute the same chemical composition.

25. The method of claim 24 wherein the chemical composition comprises Ta_2O_5.

26. The method of claim 23 comprising forming the high K substantially amorphous material and the high K substantially crystalline material to constitute different chemical compositions.

27. The method of claim 23 wherein at least one of the high K substantially amorphous material layer and the high K substantially crystalline material layer contacts at least one of the first capacitor electrode layer and the second capacitor electrode layer.

28. The method of claim 23 wherein the high K substantially amorphous material layer contacts at least one of the first capacitor electrode layer and the second capacitor electrode layer.

29. The method of claim 28 wherein the high K substantially amorphous material layer contacts only one of the first capacitor electrode layer and the second capacitor electrode layer.

30. The method of claim 23 wherein the high K substantially amorphous material layer contacts one of the first and second capacitor electrode layers and the high K substantially crystalline material layer contacts the other of the first and second capacitor electrode layers.

31. The method of claim 23 wherein the high K capacitor dielectric region is formed to be the only capacitor dielectric region received between the first and second capacitor electrode layers, and consists essentially of the high K substantially amorphous material layer and the high K substantially crystalline material layer.

32. The method of claim 23 wherein the high K substantially amorphous material layer is formed to be at least 98% amorphous, and the high K substantially crystalline material layer is formed to be at least 98% crystalline.

33. A capacitor forming method comprising:

forming a first capacitor electrode layer over a substrate;

depositing a substantially amorphous first high K capacitor dielectric material layer over the first capacitor electrode layer;

converting the substantially amorphous high K first capacitor dielectric material layer to be substantially crystalline;

after the converting, depositing a substantially amorphous second high K capacitor dielectric material layer over the substantially crystalline first high K capacitor dielectric material layer; and

forming a second capacitor electrode layer over the substantially amorphous second high K capacitor dielectric material layer.

34. The method of claim 33 further comprising after the converting and before forming the second capacitor electrode layer, oxidize annealing the second high K capacitor dielectric material layer in an oxygen containing atmosphere at a temperature of no greater than about 600°C and effective to maintain the second high K capacitor dielectric material layer substantially amorphous.

35. The method of claim 33 further comprising after the converting and before forming the second capacitor electrode layer, oxidize annealing the second high K capacitor dielectric material layer in an oxygen containing atmosphere at a temperature of from about 300°C to about 550°C and effective to maintain the second high K capacitor dielectric material layer substantially amorphous.

36. The method of claim 33 wherein the converting occurs in an atmosphere which is substantially void oxygen.

37. The method of claim 33 wherein the first and second dielectric material layers are formed to constitute the same chemical composition.

38. The method of claim 37 wherein the chemical composition comprises Ta_2O_5.

39. The method of claim 33 wherein the first and second dielectric material layers are formed to constitute different chemical compositions.

40. The method of claim 33 wherein the second capacitor electrode layer is formed to contact the substantially amorphous second high K capacitor dielectric material layer.

41. The method of claim 33 wherein the first high K capacitor dielectric material layer is formed to contact the first capacitor electrode layer.

42. The method of claim 33 wherein the first high K capacitor dielectric material layer is formed to contact the first capacitor electrode layer, and the second capacitor electrode layer is formed to contact the substantially amorphous second high K capacitor dielectric material layer.

43. The method of claim 33 wherein the first high K capacitor dielectric material layer is formed to contact the first capacitor electrode layer, the second high K capacitor dielectric material layer is formed to contact the first high K capacitor dielectric material layer, and the second capacitor electrode layer is formed to contact the second high K capacitor dielectric material layer.

44. A capacitor forming method comprising:

forming a first capacitor electrode layer over a substrate;

depositing a substantially amorphous first high K capacitor dielectric material layer over the first capacitor electrode layer;

oxidize annealing the first high K capacitor dielectric material layer in an oxygen containing atmosphere at a temperature of no greater than about 600°C;

after the oxidize annealing of the first high K capacitor dielectric material layer, converting the substantially amorphous high K first capacitor dielectric material layer to be substantially crystalline;

after the converting, depositing a substantially amorphous second high K capacitor dielectric material layer over the substantially crystalline first high K capacitor dielectric material layer;

oxidize annealing the second high K capacitor dielectric material layer in an oxygen containing atmosphere at a temperature of no greater than about 600°C and effective to maintain the second high K capacitor dielectric material layer substantially amorphous; and

forming a second capacitor electrode layer over the substantially amorphous second high K capacitor dielectric material layer.

45. The method of claim 44 further wherein the first and second oxidize annealings comprise annealing in an oxygen containing atmosphere at a temperature of no greater than about 600°C.

46. The method of claim 44 wherein the converting occurs in an atmosphere which is substantially void oxygen.

47. The method of claim 44 wherein the first and second dielectric material layers are formed to constitute the same chemical composition.

48. The method of claim 47 wherein the chemical composition comprises Ta_2O_5.

49. The method of claim 44 wherein the first and second dielectric material layers are formed to constitute different chemical compositions.

50. A capacitor forming method comprising:

forming a first capacitor electrode layer over a substrate;

depositing a substantially amorphous first high K capacitor dielectric material layer over the first capacitor electrode layer;

converting the substantially amorphous high K first capacitor dielectric material layer to be substantially crystalline;

after the converting of the substantially amorphous high K first capacitor dielectric material layer, oxidize annealing the first high K capacitor dielectric material layer in an oxygen containing atmosphere at a temperature of no greater than about 600°C;

after the oxidize annealing of the first high K capacitor dielectric material layer, depositing a substantially amorphous second high K capacitor dielectric material layer over the substantially crystalline first high K capacitor dielectric material layer;

oxidize annealing the second high K capacitor dielectric material layer in an oxygen containing atmosphere at a temperature of no greater than about 600°C and effective to maintain the second high K capacitor dielectric material layer substantially amorphous; and

forming a second capacitor electrode layer over the substantially amorphous second high K capacitor dielectric material layer.

51. The method of claim 50 further wherein the first and second oxidize annealings comprise annealing in an oxygen containing atmosphere at a temperature of no greater than about 600°C.

52. The method of claim 50 wherein the converting occurs in an atmosphere which is substantially void oxygen.

53. The method of claim 50 wherein the first and second dielectric material layers are formed to constitute the same chemical composition.

54. The method of claim 53 wherein the chemical composition comprises Ta_2O_5.

55. The method of claim 50 wherein the first and second dielectric material layers are formed to constitute different chemical compositions.

add D2

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